

# REPORT DOCUMENTATION PAGE

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13. ABSTRACT (Maximum 200 words) THIS IS A PROGRESS REPORT ON AEROJET'S STUDIES OF EXPERIMENTS CURRENTLY UNDERWAY (E.G., PLANT GROWTH & DIMP & DCPD LYSIMETER TESTS). THE FULL SCALE LYSIMETER TESTS ARE CONTINUING. THE FIRST GROUP OF LYSIMETERS HAS BEEN UNDERGOING CONTAMINANT IRRIGATION FOR 199 DAYS, THE SECOND GROUP FOR 56 DAYS. THE FULL SCALE SOIL CULTURE TESTS ARE CONTINUING.			
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AEROJET ORDNANCE AND MANUFACTURING COMPANY

9236 East Hall Road  
Downey, California 90241

DETERMINATION OF DECONTAMINATION CRITERIA

DIMP AND DCPD (U)

Report No. 1953-01(12)MP

Rocky Mountain Arsenal  
Information Center  
Commerce City, Colorado

Contract DAMD-17-75-C5069

to

U.S. ARMY, Ft. Detrick  
Fredrick, Maryland 21701

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Prepared by: P. A. O'Donovan  
P. A. O'Donovan

Date: 7 July 1976

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Progress on items proposed for action during June, 1976 is discussed in the following paragraphs.

#### FULL SCALE LYSIMETER TESTS

The full scale lysimeter tests are continuing. These tests are utilizing five types of soil: Chino - sandy clay loam; Brawley - silty clay; Ventura - clay loam; Fullerton - sandy loam; and Walnut - clay loam. The lysimeters are divided into two sets, each set contains one of each of the above types of soil. In one set the lysimeters are irrigated bi-weekly with two inches (12, 887 ml) of 20 ppm (parts per million) DIMP (diisopropyl methyl phosphonate) in distilled water, in the other set the top foot of soil was mixed with 20 ppm DIMP and is being irrigated bi-weekly with 2 inches of distilled water. The first type represents a chronic contamination condition and the second represents conditions encountered in a single spill.

The first group of lysimeters has been undergoing irrigation for 199 days, the second group for 56 days. After approximately the first six weeks the irrigation frequency of the second group has been reduced to every two weeks. This is true now for both groups of lysimeters. Table 1 shows the moisture content for the Group 2 soils as a function of depth after a one week drainage period. Figure 1 is a plot of this information. Figure 2 is a plot of the average moisture values of all the Group 2 lysimeters compared to similar data from Group 1. From this data it appears that the moisture content of the soils is approaching an equilibrium value.

A means of evaluating the drainage rates of the lysimeters has been established as the drainage efficiency (volume of liquid drained out  $\div$  volume of liquid applied) of each lysimeter. Figure 3 is a plot of the drainage efficiencies of the Group 1 lysimeters. Figure 4 is a plot of the same data

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Table I

% Loss on Drying of Soil from West Lysimeter  
(Group 2)

	Chino	Brawley	Ventura	Fullerton	Walnut	Mean
1/8" - 6"	11.08	9.24	11.09	8.83	15.60	11.17
6" - 12"	15.20	15.51	12.91	13.38	12.92	13.98
12" - 18"	14.98	16.55	15.20	14.75	17.46	15.79
18" - 24"	16.13	4.49	14.72	14.65	19.32	16.21
24" - 30"	20.60	15.29	16.94	16.05	18.96	17.57
30" - 36"	14.38	19.63	17.37	16.64	16.82	16.97
36" - 42"	16.39	20.96	18.90	17.39	22.33	19.19
42" - 48"	17.61	20.60	18.60	19.01	24.11	19.99
48" - 54"	17.07	20.23	17.07	19.68	15.57	17.92
54" - 60"	17.73	20.39	17.23	20.74	23.57	19.93

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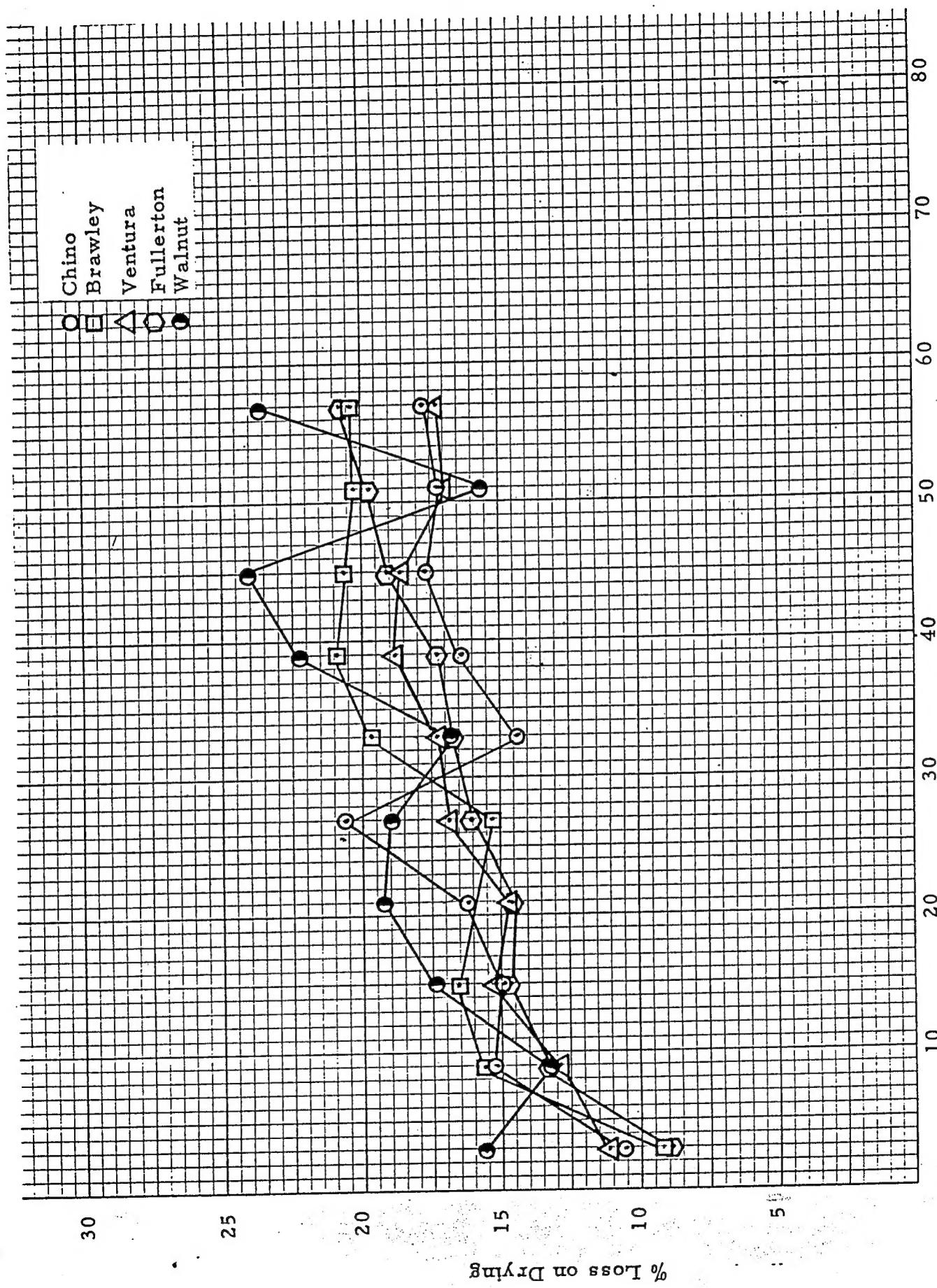


Figure 1. Moisture Content of Group 2 Lysimeters (West)  
 Average Sample Depth (in)

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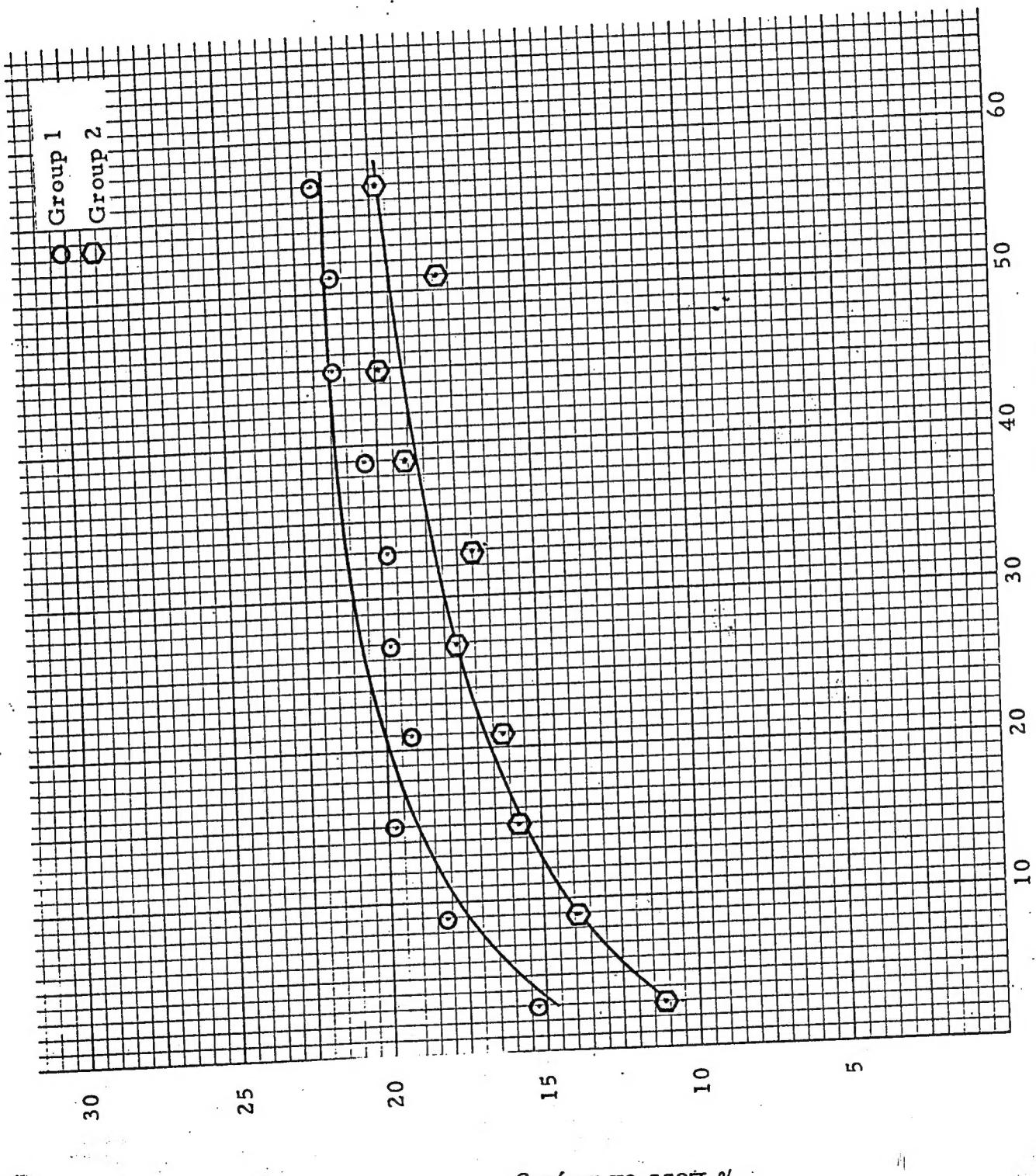


Figure 2. Average moisture content of lysimeters (after 1 week drainage)

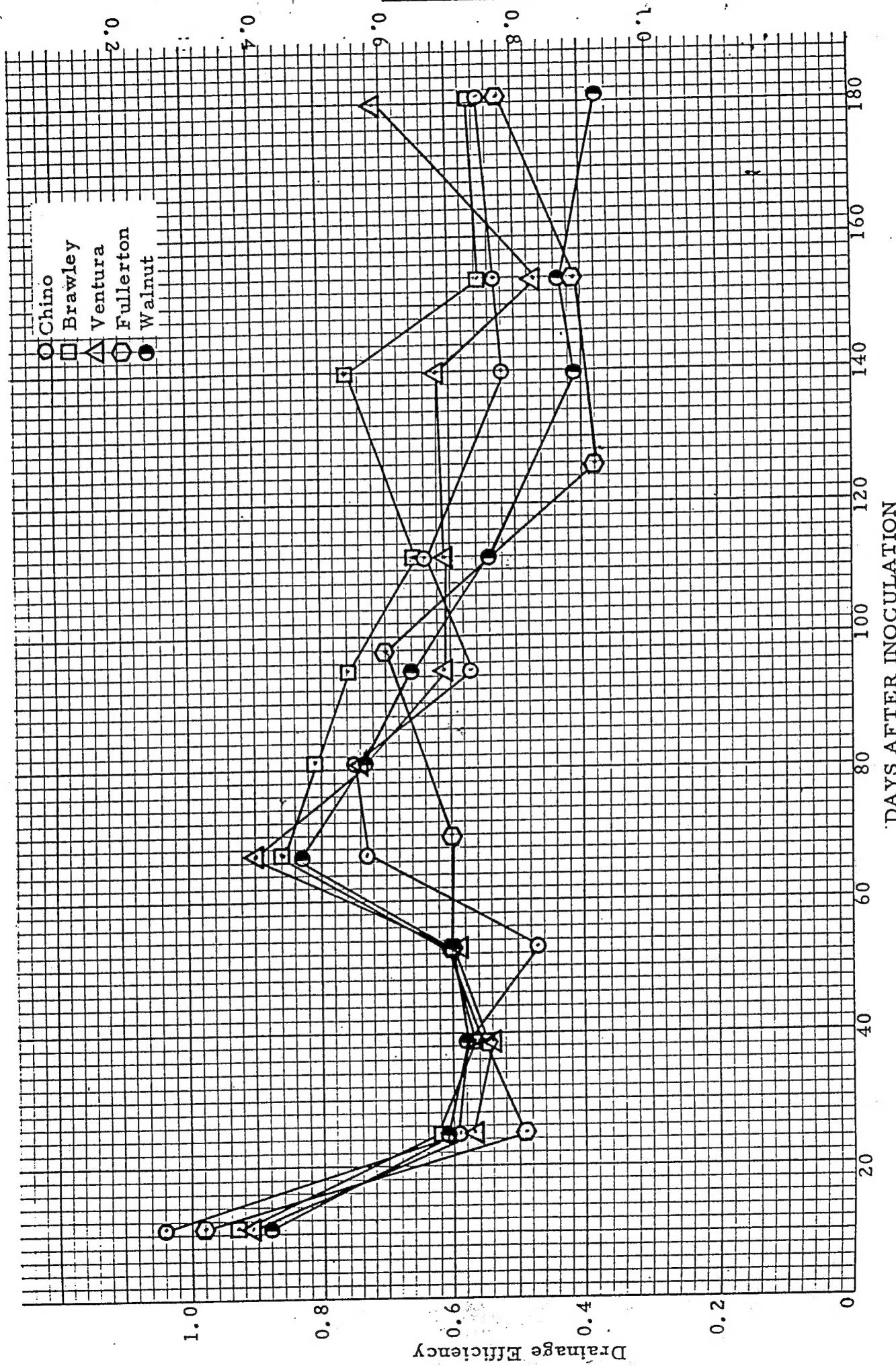


Figure 4. Drainage efficiencies versus time. Average drainage of each two successive pairs of points.

averaging each two successive pairs of points.

Figure 5 shows the drainage efficiencies versus time for the Group 2 lysimeters. Figure 6 is a composite comparison of the overall average drainage efficiencies of Group 1 and Group 2 lysimeters. Both of these curves still seem to be generally aiming at approximately a 50% drainage efficiency.

Tensiometer water samples have been taken at the end of each drainage period. Available DIMP content of these samples is given in Tables 2 and 3. Figure 7 a, b, c, d and e show the average DIMP values as points superimposed on the line for the average values of the last month. In general the DIMP values are maintaining relatively consistent patterns. This could indicate that an equilibrium condition is being achieved.

Figure 8 is a plot of the data in Table 3 for Walnut soil. These data appear to indicate that the single charge of DIMP is slowly moving down in the soil and in the process is being compressed into a band somewhat narrower than the original one foot width. This is true of all the lysimeters.

DIMP contents of the soil samples from Groups 1 and 2 lysimeters are shown in Tables 4 and 5 respectively.

The data from Group 1 generally indicates that the chronic addition is resulting in a concentration gradient decreasing from top to bottom of the lysimeter while the single charge results in a band of DIMP slowly moving down through the soil.

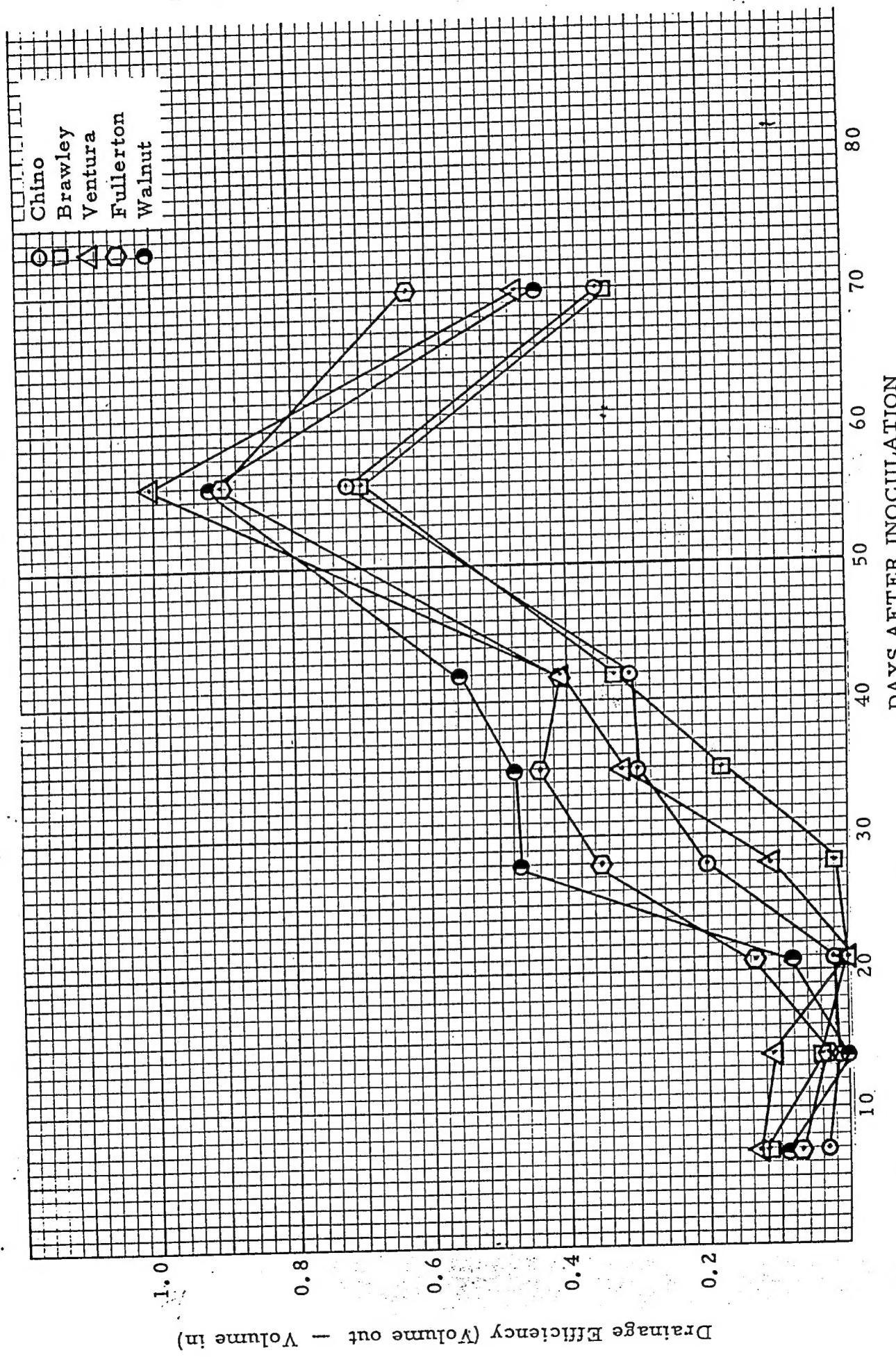


Figure 5. Drainage efficiencies of various soils in Full Scale Lysimeters (Group 2)

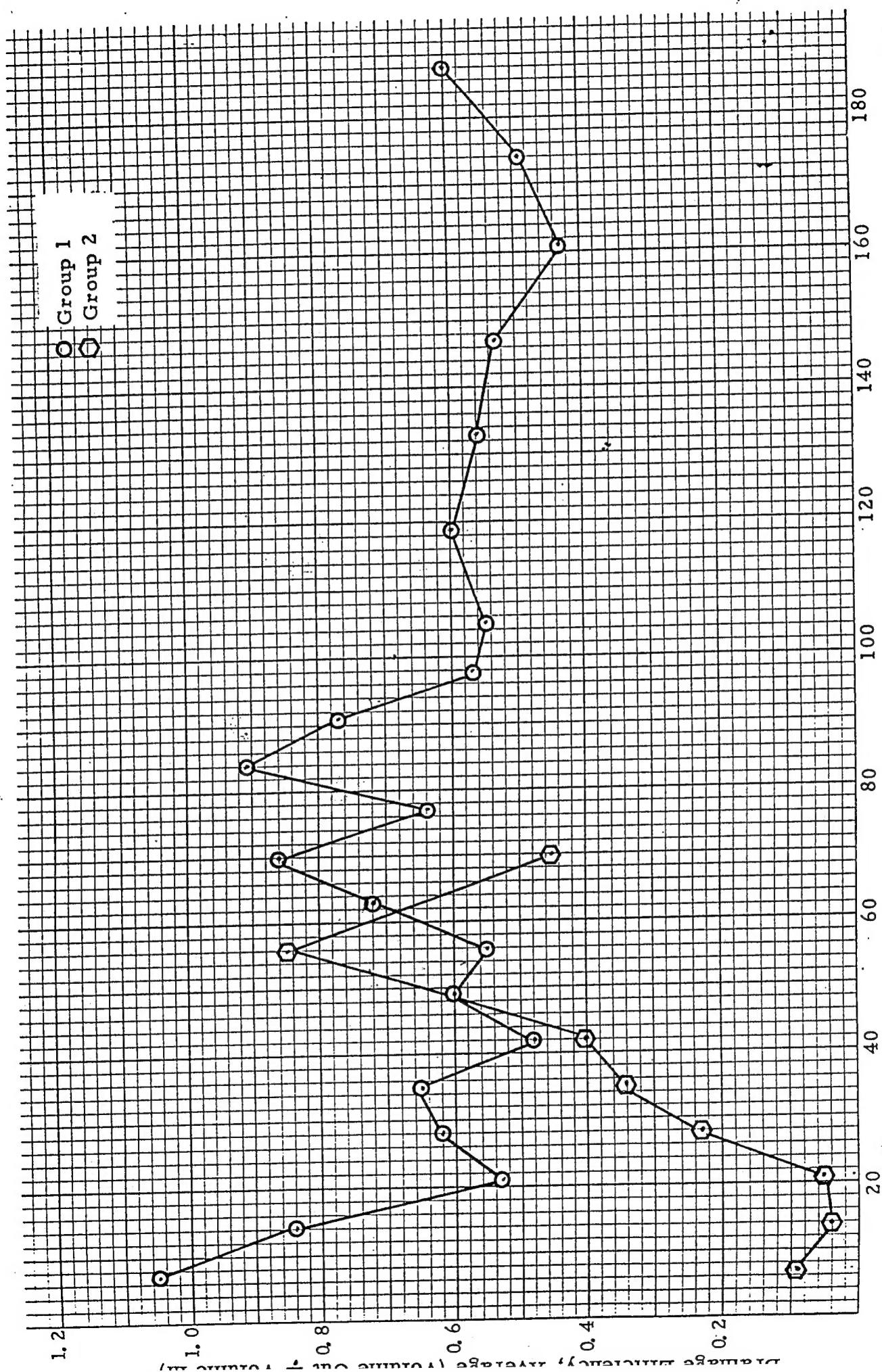


Figure 6. Drainage efficiencies of various soils in full scale lysimeters, average of all samples.

Table 2

## DIMP Content of Tensiometer Water Samples (Group 1 East)

Depth	Ventura	Chino	Fullerton	Walnut	Brawley
(ppm @ 185 days)					
6"	4.06	---	4.93	---	7.17
18"	1.06	7.17	5.44	5.40	9.65
30"	1.20	7.41	2.37	---	---
42"	1.28	6.31	2.51	4.37	6.95
54"	2.89	5.29	1.71	2.44	0
60"	4.62	4.52	1.62	1.86	5.56
(ppm @ 199 days)					
6"	7.98	4.96	9.75	---	8.98
18"	1.54	4.89	7.87	---	7.89
30"	1.62	3.56	6.29	7.71	---
42"	2.46	4.03	2.68	5.73	5.18
54"	5.67	---	2.88	5.57	3.63
60"	6.79	4.32	3.74	4.15	4.22
(Average ppm @ 192 days)					
6"	6.02	---	7.34	---	8.08
18"	1.30	6.03	6.66	---	8.76
30"	1.41	5.49	4.33	---	---
42"	1.87	5.17	2.60	5.05	6.07
54"	4.28	---	2.30	4.00	---
60"	5.71	4.42	2.68	3.01	4.89

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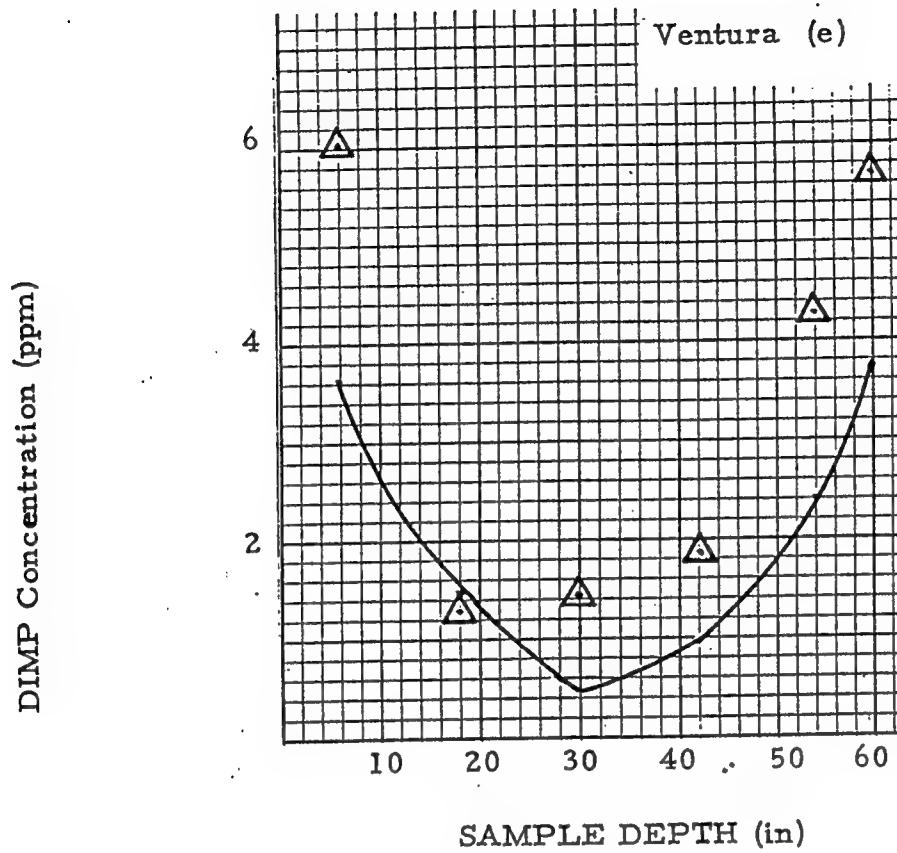


Figure 7 (cont'd.). DIMP concentration vs. Sample Depth, Group I  
Lysimeters (Tensiometers)

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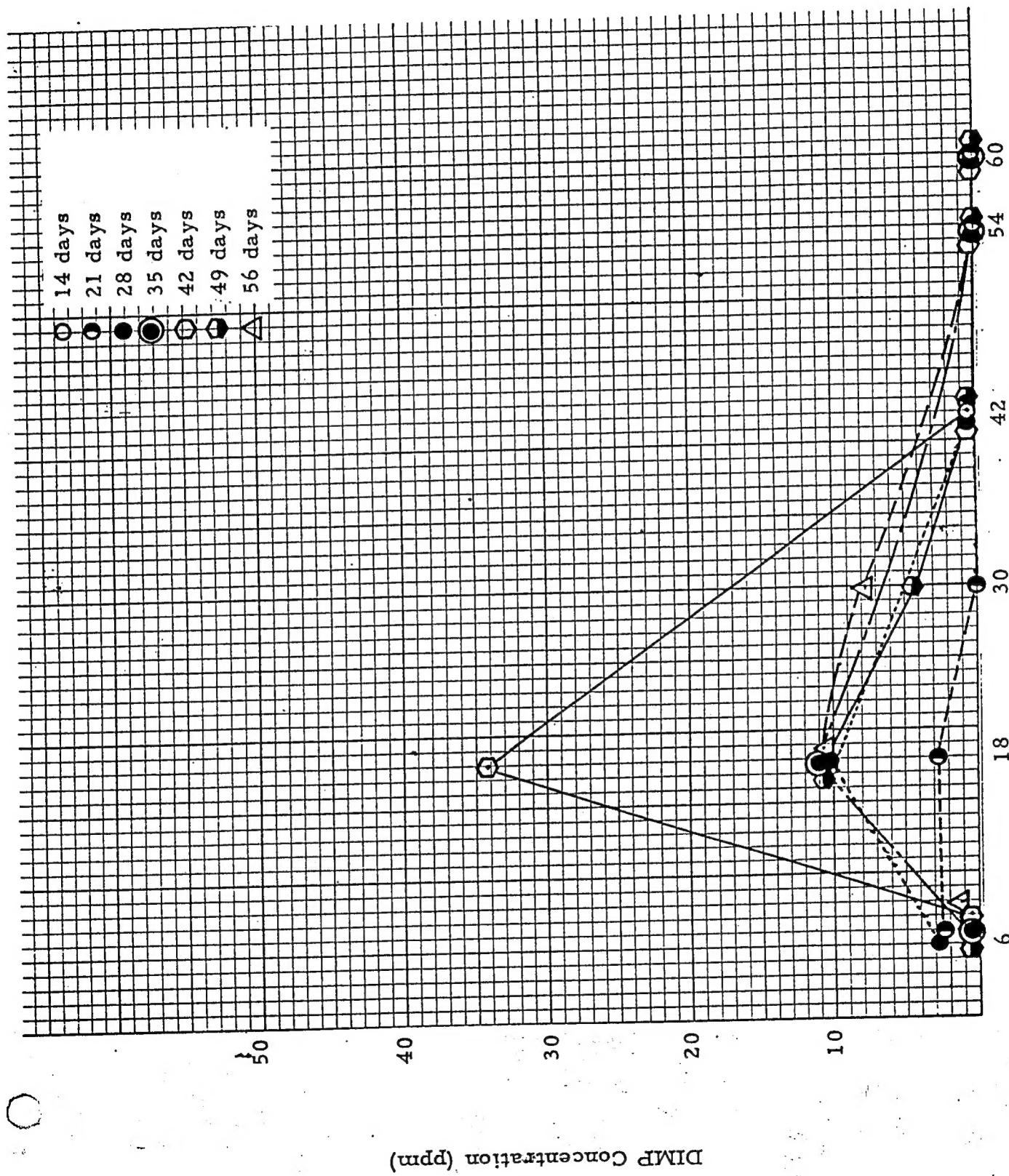


Figure 8. DIMP content of water from Group 2 Lysimeters, Walnut

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Table 4

DIMP Content of Soil Samples Group I (ppm) (188 days)

Depth	Ventura	Chino	Fullerton	Walnut	Brawley
0 (surface)	20.7	23.3	9.9	44.0	38.6
0 - 6"	10.9	12.3	6.8	38.1	35.7
6 - 12"	8.7	10.5	7.3	26.1	43.2
12 - 18"	4.1	10.3	5.8	14.6	24.7
18 - 24"	5.4	8.8	4.7	7.7	12.2
24 - 30"	2.2	7.5	4.2	2.7	33.1
30 - 36"	1.6	7.2	4.8	2.1	18.1
36 - 42"	2.8	6.8	3.4	4.4	33.0
42 - 48"	2.0	6.4	5.2	1.9	21.9
48 - 54"	1.7	4.9	4.6	5.6	24.8
54 - 60"	2.5	3.7	2.3	0	19.5
Total weight sampled	234.0	303.6	237.3	159.7	167.7

Total weight DIMP added to date =  $21 \times 0.2577\text{g} = 5.4117\text{g}$ .

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Table 5

DIMP Content of Soil Samples Group 2 (ppm) (56 days)

Depth	Ventura	Chino	Fullerton	Walnut	Brawley
0, (surface)	0	0	0	0	0
0 - 6"	0	0	0	0	0
6 - 12"	0	0	0	0	0
12 - 18"	0	9.0	0	0	0
18 - 24"	53.4	19.4	23.4	2.0	0
24 - 30"	52.9	18.2	47.3	48.8	136.2
30 - 36"	29.6	28.0	45.8	12.5	0
36 - 42"	21.8	8.4	11.4	0	0
42 - 48"	0	1.1	0	0	0
48 - 54"	0	3.1	0	0	0
54 - 60"	0	0.1	0	0	0
Total weight sampled					

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SOIL CULTURE EXPERIMENTS

The full scale soil culture tests are continuing. As noted in the hydroponic plant series, the presence of contaminant appears to enhance the growth of the plants in their early stages. The plants are currently being observed for any negative phytotoxic effects. Analysis of plant tissues should commence in July to determine uptake of contaminants.

PROPOSED ACTIVITY DURING JULY, 1976

- Continue soil culture growth experiments including plant tissue analysis for contaminants.
- Make decision as to need for contaminant concentration levels in soil culture experiments.
- Continue treatment and analysis of lysimeter soil and water samples.
- Implement procedures suggested by consultant personnel for analysis of DCPD in soils.